



Smart Cities in Taiwan Introduction Booklet

Taipei Economic & Cultural Office in Thailand

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1. **Smart Government-National Development Council**

1.1 Promotion of smart government: current situation

1.1.1 (DIGI+) program: The Executive Yuan approved the Digital Nation and Innovative Economic Development Program (DIGI+) program on November 24, 2016. The objective of one of the main themes, “Digital Nation,” is “civic participation in open government and intelligent governance” that the people can feel, guiding all the subordinate agencies of the Executive Yuan to develop digital government services that meet the needs of the people on a priority basis.

1.1.2 Smart Government Action Plan: To accelerate the government’s digital transformation, together with the various subordinate agencies of the Executive Yuan, the NDC drew up the Smart Government Action Plan (approved by the Executive Yuan on June 6, 2019) ,planning to establish two basic frameworks, namely, “Full Issue of New eID” and “Establish a secure and trusted data exchange system (T-Road)”. In future, using a digital ID on the T-Road portal website, people will be able to apply for various government services through the T-Road and receive initiative service from the government and personalized data to achieve the objective of 80% of applications for government services conducted online by 2020 and realize the smart government goal of “convenient, efficient, 24/7 service”.

1.2 Taiwan’s area advantages for promoting smart government

1.2.1 Expanding the release of data for the use of all circles:

- Government Open Data: The NDC began promoting a policy of maximization of government open data in 2018 and, to date, 40,000 data sets have been opened; 64% of these datasets meet the “machine readable, structured and open format” data standard; this result leads the world. In terms of data use, up to the end of September 2019, data had been downloaded 13.5 million times, with the most popular data transportation, tourism and travel and weather observation. Also, with regard pay to use or restricted use data, government agencies are required to draw up data

release and management regulations to allow civil organizations to apply according to the regulations.

- Autonomous use of personal data (My Data): The My Health Bank service has been promoted, allowing people to download their own national health insurance medical information and keep abreast of their seeking of medical attention, medication use and tests (examination), raising the level of health-self management. The Open Banking policy is being promoted, to give control over financial data back to consumers; through cross-industry combination of bank and Third-Party Service Providers (TSP) , consumers are provided with more innovative financial services to satisfy the personal financial requirements of consumers. Every level of government is required to allow people to download personalized data to remove the need for paper documents or transcripts when applying for government services, speeding up end-to end online application for government services and precision personalized services.
- National Geographic Information System (NGIS) as reference for decision making: Taiwan has been promoting the National Geographic Information System(NGIS) since the 1980s.Essential maps for national land planning, such as nationwide electronic maps, national numerical terrain models, and aerial imagery are set up; the database of national land information system, data operational standards regulation were established, making NGIS an important tool for governance and decision making.
- Taiwan is currently speeding up the opening and application of based maps, has set 3D data standards and is promoting 3D pipeline management, 3D GIS development, GIS value-added application and industrial development to speed up the increase of national competitiveness. In future the public governance application of GIS will be promoted with regard smart agriculture, smart transportation, smart

environment, smart disaster prevention and other application themes.

- Complete government infrastructure and digital services: The Government Service Network (GSN) connects all government agencies and forms an exclusive government network. Government Public Key Infrastructure (GPKI) ensures network secure identity verification mechanism; the Electronic Toll Collection (ETC) system is used by 94% of vehicles on national freeways. 6.5 billion of the universal electronic invoices are issued annually; the E-Gate automatic customs clearance inspection service, E-Gate, completes exit inspection in 12 seconds and has handled more than 80 million people. The simplified administration and public convenience online tax return (e-Taxation) that takes just five minutes was used by 96% of people to file a tax return in 2018. The iTaiwan wireless network provides citizens with free use of wireless Internet when handling business, on public transport and at scenic spots.

1.3 Areas of cooperation with Thailand: It can be promoted in future: It is suggested that the two sides enhance smart government related issue exchange and cooperation, including sharing and exchanging information and experience relating to smart government, attending digital transformation related international meetings or seminars held by both governments and conducting mutual visits and exchange.

2. **Smart Agriculture -Council of Agriculture**

2.1 Current R&D situation of Smart Agriculture in Taiwan

The Smart Agriculture Program was launched by Council of Agriculture (COA) since 2017 in Taiwan. The fundamental of the program is based under the New Agricultural Innovation Promotion Program. It introduces intelligent devices, sensing technology, Internet of Things (IoTs) and big data analysis to agricultural applications by digitizing knowledge, automating production, optimizing products and simplifying operations. To promote the

Smart Agriculture program, ten of industries in agriculture in Taiwan have been originally selected: orchid, seedling, mushroom, rice, agricultural facility, four main export crops, offshore fishery, aquaculture, poultry and dairy etc. In order to strengthen the effective diffusion of technology and increase the participation of businesses, the incentive programs have been proposed to encourage the transformation in agro-industries; on the other hand, the COA promotes “Smart Farmers Union” as well to build up a new partnerships between contractor and agribusiness, and to upgrade the competitiveness of the industry.

2.2 Taiwan’s Advantages in Smart Agriculture

Taiwan’s researchers of agriculture are energetic and the results of R&D are fruitful, and agricultural production skills are mainly refined, diversified and characterized. Many farmers have the willingness to try new technologies for harvesting the high-quality agricultural products. Moreover, our ICT’s industry have world-class standards, and lots of experiences and achievements in manufacturing or exporting industrial products have been gained, such as consumer electronics, the Internet of Things (IoTs) components, and big data analysis etc. So far, many successful cases of smart agriculture have been developed. Taiwan’s site has the ability to share the smart agriculture experiences to Thailand’s site through mutual cooperation.

2.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Agriculture

Taiwan is one of the pioneering countries to promote smart agriculture. Taiwan’s companies have cooperated with Thailand in recent year to provide unmanned agricultural vehicle for spraying and supplying growth’s monitoring services in rice field. Cases on-going in Smart Agriculture Program, it is found that the drone used to good control effect, high efficiency and pesticide saving for agricultural spraying. Taking the dragon fruit as an example, the drone agricultural spraying volume only needs 1/10 to 1/15 compared to manual spraying, and the spraying efficiency can be

increased by 4 times, can achieve the same control effect, improve the efficiency of friendly farming. In addition to unmanned agricultural vehicle, the program has mechanization of planting vegetables in the isolated greenhouse, assistive robotic exosuit, remote monitor and control system, and so on. That can reduce labor's need and improve operational management efficiency. All of the above, Taiwan and Thailand can be cooperated in Smart Agriculture.

3. Smart Healthcare -Ministry of Health and Welfare

3.1 Taiwan's current situation in Smart Healthcare

When it comes to “Smart Healthcare”, most people can point out bunch of advantages towards healthcare services like increase access and affordability, improve quality, and reduce costs. Taiwan, as a front-runner in Smart Healthcare, has a well-developed medical system, public health networks and the National Health Insurance, which are well-known worldwide, helps Taiwan to develop Smart Healthcare with the strong information and communication technology (ICT) capability, and transits healthcare to new models of patient-centered care. A place where academic, private, and public institutions work together to create products and systems that contribute to smart healthcare.

The Taiwan NHI-MediCloud established in July 2013, which is a patient-centered health insurance information system. The information updates on a rolling daily basis, taking about 10-15 seconds to display the information. Starting from January 2018, through digital cloud tools, physicians and pharmacists in Taiwan can retrieve test reports—including CT scans, MRIs, ultrasounds, gastroscopies, colonoscopies and X-rays—from secondary and tertiary institutions and receive prescription information. The system allows authorized medical practitioners to request and receive up-to-date medical records of patient.

Smart Healthcare has a wide variety of applications such as wearable device, intelligent robot, speech/face recognition, cloud

data and AI diagnosis...etc. Now Taiwan is also focusing the Smart Healthcare on the most promising fields in ICT, such as AI, 5G, IoT, and XR, with its superior technology, leading the world toward a new frontier.

3.2 Taiwan's strength in Smart Healthcare

According to HSBC Expat Explorer Survey, 2014, two-thirds of the expats say they are satisfied with the higher quality of healthcare in Taiwan. The National Health Insurance (NHI) system ensures that every resident has access to quality and affordable care. Coverage includes inpatient and outpatient care, prescription drugs, traditional Chinese medicine, dental services and home nursing care. The ICT industry has long been one of the major drivers of Taiwan's economic growth. Taiwan ranked 13th among 140 economies and 4th in the Asia-Pacific in the Global Competitiveness Report published in 2018 by Geneva-based World Economic Forum. In addition, the International Institute for Management Development in Switzerland announced the 2018 World Digital Competitiveness Ranking, in which Taiwan was ranked 16th in the world. Besides, global tech giants like Microsoft, Micron, and Supermicro are opening or expanding operations in Taiwan technical cooperation, R&D applications, and consideration of strategic alliances. The three major advantages, including "top medical technology", "comprehensive technology industry supply chain", and "sufficient energy of biotechnology manufacturing industry", become a strong back up for Smart Healthcare innovation in Taiwan. The Economist also had listed Taiwan the 2nd efficiency and innovation of the healthcare system in Asia-Pacific. Taiwan not only contributes to establishing new guidelines for global disease treatment but may also become a leader in many worldwide medical cases in the future. With steady upgrading of the quality and competitiveness of the pharmaceutical and medical devices industries, Taiwan is integrating its leading-edge information technology capacities with innovative medical management to establish a smart health environment.

3.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Healthcare

Thailand is undergoing economic transformation, moving forward to becoming a valued-based and innovation-driven economy under the Thailand 4.0 policy, which targets 10 industries. The integration and promotion of the use of appropriate digital technologies for healthcare is significant part of Thailand 4.0. Thailand also aims to be the medical hub in ASEAN. The Thai government is actively introducing and promoting smart medical-related products and solutions, which are line with Taiwan's current industrial advantages. Smart healthcare is using ICT products and systems to improve the quality of patient care and reduce the workload of medical personnel. Taiwan has proven itself as being in a commanding position in the development and manufacturing of tech and has the best health insurance system in the world. The system has expedited the development of Taiwan's IT products, systems and medical devices, forming a total smart healthcare solutions by companies in the ICT industry in Taiwan. Taiwan is taking advantages of ICT technologies in integrated healthcare systems and preparing to export solutions and supply chain products to Thailand.

4. **Intelligent Building -Ministry of Interior**

4.1 Taiwan's current situation in Intelligent Building

Based on the advantages of Taiwan's ICT industry, the Institute of Architecture of the Ministry of the Interior has promoted the certification system for intelligent buildings since 2003. At the Strategic Review Board (SRB) Meeting in 2005, the Executive Yuan discussed the issue of "the developmental strategies of intelligent living space", making use of the advantages in ICT industry to development the intelligent living space industry. Since 1999, we have built three exhibition centers in Taipei, Taichung and Kaohsiung, and more than 330,000 people have visited these centers.

4.2 Taiwan's strength in Intelligent Building

More than 450 buildings have received the Ministry of the Interior's Intelligent Building Label or Candidate Intelligent Building Certificate. The 1st excellent intelligent building works selection activity selected 6 winning entries in 2018. The relevant government departments and industries have a lot of intelligent building knowledge and experience.

4.3 The potential areas in which Taiwan and Thailand can cooperate in Intelligent Building

The Institute of Architecture of the Ministry of the Interior is very pleased to share with the countries the Intelligent Building certification system to promote experience. The intelligent living space exhibition centers will be operated to allow visitors from abroad to visit.

5. Taipei City

5.1 Smart Education

5.1.1 Status quo of promoting smart city in Taipei

Taipei City Government (hereafter referred as TCG) participated Smart City Asia Pacific Awards (SCAPA) host by IDC Asia/Pacific and become one of the winners with the project "Crossing Learning Barriers: Omni Smart Education" in the category of education. The awards were composed of 6 stages of strict reviews and it is the first time for both Taipei and Taiwan to be awarded in this category. TCG has been investing in omni smart education since 2018 with a budget approximately of 1.6 billion NTD in the 4 main fields as follow: setting up smart network in campuses, setting up smart future classrooms, promoting digital learning platforms, and promoting mobile studying and smart teaching. TCG aims to provide diversified yet integrated education services for students, parents and teachers. We work to empower students of the autonomous learning, encourage teachers to apply

innovated teaching, and to improve the interactions between parents and teachers with the aid of technology.

5.1.2 Taipei's advantage of cooperation with Thailand

Taipei is well-known of its exceptional education system and that its students received excellent scores in science and mathematics in PISA Test. In September 2017, a study visit consist of 139 guests from Office of the Basic Education Thailand visited Taipei and recognized the accomplishments of Taipei Cooc-Cloud (臺北酷課雲), the integrated cloud study resources and teaching methods provided by Digital Education Center Taipei. Taipei Cooc-Cloud is composed of most main education services and integrated information in schools and can be accessed with SSO (Single-Sign-On). Taipei Cooc-Cloud provided 10,961 online study videos, 43,821 examination questions made public, 2,078 online courses; teachers and students from grade 1 to 12 can use all these resources before, in, and after the class. TCG has been promoting Mobile Learning and Smart Teaching since 2015. Mobile tablets and digital learning platforms are integrated. Mirror image casting, classroom management, and cloud resources are also provided for the learner-oriented education. TCG also has been promoting the education of emerging technologies proactively. The 3R Teaching Base in Taipei is the first in the country. The 3R (AR, VR, MR stands for augmented reality, virtual reality, and mixed reality respectively) and 3A(AI, ADAS, AR stands for artificial intelligence, advanced driver-assistance systems, and augmented reality respectively)technologies help create an immerse-learning environment which allows students to grasp academic concepts more easily with the senses of seeing, hearing, and tactile sensation. In the same time TCG has been encouraging AI-related courses and student clubs in schools.

5.1.3 Suggested fields of cooperation

- Taipei Cooc-Cloud (臺北酷課雲): This online teaching platform established by TCG that provides online courses and real-time interactions. It also assist teachers to prepare and share teaching plans and materials, students to record one's own academic portfolios, and parents and teachers to communicate with each other. For more information, please visit <http://cooc.tp.edu.tw/index.htm?lang=en-US>
- Maker Education and Technology Centers: The 10 Maker Education and Technology Centers established by TCG provide comprehensive maker resources including brick building, machinery, paper art and woodwork. The centers aim to help students become proactive, innovative and independent problem-solvers and future leaders.

5.2 Smart Transportation

5.2.1 Taiwan's current situation in Smart Transportation: Taipei has been developing ITS for more than 27 years. From the first tier of Infrastructure Development (1990-), the second tier of Services Systematization (1999-), the third tier of Sharing ITS Services (2000-), the fourth tier of Inauguration of Smart City Program (2014-), and the fifth tier of Smart City Lifestyle (2017-). It is expected that the future of the city will be improved by ITS technology and management thinking, inspection of people's needs, inter-regional cooperation, integration of transport facilities and proper application of information technology. From 1990, we have applied innovative technology and information to solve the problems of the public and to construct the government, the public and the industrial co-existence system. In the future, Taipei will be a "living lab" that can provide more intelligent services for people. The citizens in Taipei will enjoy a smart city lifestyle.

5.2.2 Taiwan's strength in Smart Transportation: Taipei Smart City Lifestyle in Transportation mainly includes several

servicess: bike, bus, Metro. There are 400 stations and 13 thousand bikes for bike sharing system (Youbike). About 5-10 minutes walking distance, you can find a Youbike station. You can find where to rent or park in APP. More than 500 km bike lanes exist in Taipei area. You can rent a bike easily to travel in the city. Comprehensive and Smart Bus Services connect everyone. There are 3,313 buses and 286 routes in Taipei. 97.5% of land area is covered by public transport, with only a 500-meter walk to reach a bus stop. Everyday 1.3 million people take bus to the destination. We requested all buses to install the GPS system, and use the GPS data to create a dynamic bus information system. Passengers get bus real arrival time at bus stops or on mobile phone from dynamic bus information system. The accuracy rate of smart bus system is over 95%. Reliable Smart MRT system saves your time. Now, the MRT system have 5 lines, 117stations. There are 2 million passengers a day. MRT trains and stations offer public wifi services for passengers. On time performance is 99.6%. With its smart train control and management systems, Taipei MRT's reliability index (MKBF) was the best in the world for a consecutive five years.

5.2.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Transportation: Bike sharing system, Motorbike sharing system, Traffic control system, Smart parking system, and Dynamic bus information system.

5.3 Smart Healthcare

5.3.1 Taiwan's current situation in Smart Healthcare

The Department of Health, Taipei City Government (hereafter, referred to as "the Department") has been dedicated to promoting "Smart Healthcare". Considering the available medical resources and facilities in Taipei, the Taipei City Hospital is the top choice in conducting research projects and experiments for "Smart Healthcare".

The Hospital has taken the initiative to coordinate all resources, through increasing the amount of self-developed projects, contracting establishments, field experiments, human research and clinical trials. By cooperating with the industry, schools and research institutes, the Hospital can accelerate the process of intellectualization and digitalization of hospital management and healthcare. For example, to face the issue of high prevalence among non-communicable diseases, including diabetes mellitus and dementia, the Hospital has developed the “Cloud Hospital” platform, promoted the intellectual case management system and provided telemedicine services. For outlying islands, the Lien-Chiang County, the Hospital can verify patients with a cell phone APP, allowing them to make appointments with a specialist for telemedicine services. In addition, the clinical unit at the Hospital assists in checking the inventory of current mobile medical devices, and organizing the clinical needs and suggestions from each medical unit for further device development references. As the healthcare provider, the Hospital also purchased other mobile medical devices, including the integrated portable slit lamp, ophthalmoscope and ophthalmotonometer, ophthalmology mobile medical cart and tablet-based ultrasound machine, to improve the medical and community health screening quality and patient satisfaction. By cooperating in research projects and field experiments, the Hospital supports companies to develop and experiment with artificial intelligence (AI) medical imaging device or interpretation systems, such as prospective X-ray, CT and MRI. In order to continually improve hospital management, the clinic registration system, broadcast system and visualization system at the nursing station have been introduced to the Hospital. Furthermore, huge amount of resources and budgets have

been invested in electronic medical records, strategic analysis, data application and information sharing, such as connecting the dialysis system with the machine to upload data, establishing a database with medical record information and “Decision Assisting System”, and Big data analysis on psychiatric and traditional medicine etc. Recently, the “Blockchain” technique has been applied on the development of the “Integrated Care Information Platform”, allowing physicians to design a patient-centered and family-focused treatment plan. Patients can consent via their phones, which gives permission to their physicians to review their medical records from other hospitals, and patients can also look up and revise their authorization status anytime.

5.3.2 Taiwan’s strength in Smart Healthcare

Based on the results of the “Global Views Monthly” magazine, “2019 General Competitiveness Survey among all Counties and Cities in Taiwan”, Taipei is ranked first in healthcare, compared to the other municipalities. As the capital city in Taiwan, the Department encompass mass resources and years of experiences in constructing a healthy city, and is ready to integrate with the world.

5.3.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Healthcare

According to the Ministry of Health and Welfare, “New Southbound Policy Medical and Public Health Cooperation and the Development of Industrial Chains” and the “One Country, One Center” strategy from the “Ministry of Health and Welfare New Southbound Policy Office”, one Taiwanese medical center is assigned to coordinate with one partner country. These medical centers are responsible to achieve six main targets, provide medical trainings, host exchanges, render medical consultation services to Taiwanese entrepreneurs, nurture culturally sensitive

healthcare environments, access local healthcare regulations and market opportunities, and integrate the information systems. Although Changhua Christian Hospital is the assigned medical center under the “One Center, One Country” framework, Thailand can propose “Smart Healthcare” related projects to the Taipei Smart City Project Management Office (TPMO) for future cooperation opportunities with the Department.

5.4 Smart Social Housing

5.4.1 Taiwan’s current situation in Smart Social Housing

The goal is to ensure better performance and environmental quality of social housings under the premise of promoting Taipei City social housings as smart communities; ensure residents receive more timely and comprehensive cares in terms of safety, health care, comfort, and convenience; and to enhance the efficiency of life. As the world is facing environmental issues such as climate change and energy depletion, there is an urgent need to introduce smart strategies, sustainable environmental protection, and other relevant industrial technologies to help construct smarter and more environmentally friendly social housings. In the future, we will apply smart technologies to design construction and management maintenance; and use the innovative planning concepts of ICT related technological development and Intelligent Building technology life applications to fulfill the various residential needs such as energy management, automation control, system integration, security surveillance, home care, and digital living. The goal is to perform a series of electronization, informatization and provide solutions by integrating innovative services. It is anticipated to guide the development of affordable housings followed by civil construction projects in order to achieve a win-win for the people, industry and the

government. The government will use the demonstrative smart community as the Intelligent Building pioneer example to promote Intelligent Buildings that will in turn



With the Smart Technologies, the Followings Are Created:

The living space with effective management, energy saving, comfort and convenience, and health and wellbeing.



form smart communities and eventually develop into a smart city.

It is expected to achieve the following 7

basic services:

- Provide social services: Child nursery, elderly care, employment services.
- Provide healthy, sustainable, comfortable, convenient, energy-saving, and safe smart living spaces.
- In addition to considering the urban texture, topography, and other base conditions; the architectural planning and design will also integrate architectural aesthetics, social art, smart green architecture, universal design, and safe utilization.
- Smart property management for community safety and life management services will be introduced in terms of maintenance management.
- Construct smart facilities; install smart water, electricity, and gas meters; and provide potable tap water directly from the Taipei Water Department.
- Establish an infrastructure management cloud in each community base (including rack-type cloud service server, dual WAN firewall router, anti-virus software, system integration software, community website design and construction, mobile APP development, and other

equipment) to upload the community-integrated system equipment (visitor service systems, security access control systems, energy management systems, community information, etc.) information to the community Cloud. Assign permissions and provide information query services to the community residents and management company personnel/units.

- The community cloud software must be general standard communication protocol software in order to facilitate browse and query by the relevant personnel. As the smart social housing project has just been started for 2016, we have not yet participated in any relevant international competitions.

5.4.2 Taiwan's strength in Smart Social Housing

The Taipei City Government is promoting social housing by establishing 5 major visions: 1. practice residential justice; 2. implement urban aesthetics; 3. become a smart city industry experimental field; 4. create a new residential business model; and 5. manage community relations. The goal is to provide high-quality and affordable living environment to the residents of Taipei. So architectural aesthetics, social art, and smart green architecture will be combined with the ICT-related industrial energy in Taiwan in terms of architectural planning to create a new generation of smart social housing. To implement this social housing development vision, the Taipei City Government has planned the social housing smart community demonstration base by investing an additional 3%-5% of the construction funds to build smart facilities and use smart technologies for the design, construction, management and maintenance of social housing. In addition to energy conservation, water conservation and community safety; we will also construct a smart community management Cloud, smart power grid, smart

senior health homes, etc., so residents can receive more timely and comprehensive care in terms of safety, health, and comfort. According to the Xinglong Social Housing Zone 1 experiences; smart power grid and smart community operations are able to reduce electricity consumption by over 13% compared to that of a general community. Mayor Ko indicated that all social housings in Taipei City will be equipped with the relevant smart technology facilities and be upgraded to become smart communities. We can use various smart technologies, sustainable environmental protection methods and other relevant industrial technologies to achieve energy conservation, carbon reduction and environmental sustainability during urban development in response to the environmental issues worldwide such as climate change and energy depletion.

5.4.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Social Housing

Through the promotion of smart social housing projects, we will put more emphasis on the development of ICT-related industries and establish a high-quality service system based on providing solutions. From "Taiwan Verification" to "The International Export of Taiwan's Smart City Solution", we will provide innovative service to the globally emerging smart city demand market, and reinforce the international market chain and promote Taiwan's smart technology applications, and upgrading domestic skill simultaneously. The global competitiveness of smart technology-related industries has made more international market opportunities available to export our skills.

6. Taoyuan City

6.1 Smart Traffic

6.1.1 Taoyuan's current situation in Smart Traffic

In order to provide safe and convenient transportation services for Taoyuan citizens, we have developed various intelligent traffic control systems to collect roadside information such as VD, eTag and CCTV. Under AI calculation and big data analysis, we provide transportation services through CMS, ATIS website and APP. In the traffic safety section, we have installed radars, sensors and other detection equipment at the un-signalized intersections to protect pedestrians and vehicles through information images or text screen warnings when pedestrians pass through or near the intersection of vehicles. In the convenience service section, we are promoting smart parking to replace labor charging by machine charging which reduces labor costs. Besides, we also provide

services such as smart car searching, parking space detection, and mobile payment to diversify paying parking fee.



6.1.2 Taoyuan's strength in Smart Traffic

Our smart transportation system is close to the needs of public and actually solves traffic problems. We can share our experiences with Thailand in the future.

6.1.3 The potential areas in which Taoyuan and Thailand can cooperate in Smart Traffic

The traffic flow conditions between Thailand and Taiwan are alike, with both cars and motorcycles mixed traffic.

The traffic control strategies could refer to each other, and we can exchange parking management methods in different traffic areas such as urban areas, residential areas and sightseeing areas. With the experiences sharing, learn together, grow together.

6.2 Smart Government

6.2.1 Taoyuan's current situation in Smart Government

Taoyuan city government team left for New York on June 11-13 to join in Intelligent Community Forum's (ICF) 2019 Global Summit and honored as TOP1 of the "2019 Intelligent Community of the Year." Taoyuan worked hard in the past 11 years and won 10 Smart21 and 4 Top7.

6.2.2 Taoyuan's strength in Smart Government

There were several key elements that played important roles, such as the implementation of a complete urban traffic network, the establishment of the Asian Silicon Valley, and the launching of the Aerotropolis project. Besides this, we have many years of experience integrating smart city related projects. The projects include: Citizen Card Integrated Applications, Energy Sustainability, Environmental Sustainability, Smart Transportation and Green Transportation, Sensor-Network Construction and Application, Development of Youth Entrepreneur Bases, Smart Education, Robotics and Semantic Service Applications, Smart Medical and Long-Term Care, and Public Safety and Disaster Prevention. By applying these major initiatives, Taoyuan has become the smart city that we all know and enjoy today.

6.2.3 The potential areas in which Taoyuan and Thailand can cooperate in Smart Government

Many technologies nowadays aim to benefit people's life, and Taoyuan Citizen Card is a multi-functional card that fulfills this category. It can act as an ID card, library card, electronic wallet, and will soon be able to be used for

transportation, bike rental and a sports card at the public sports center. It can improve citizen's life greatly and in the future, the mobile citizen card can be used on 4G smart phones. It will have a mobile payment function, and people can access the card without carrying one.

6.3 Smart Energy

6.3.1 Taoyuan's current situation in Smart Energy

Taoyuan City's industrial electricity consumption accounted for 16.7% of the total industrial electricity consumption. Moreover, the proportion of industrial electricity and total electricity consumption is 69.1% in Taoyuan City. The roof type solar photovoltaic is the main renewable energy policy, the growth rate of installed capacity of solar power is significant.

Year	Solar	Wind	Others(Hydro)	Total
2012	2.97	88.804	130	221.774
2013	3.702	93.409	130	227.111
2014	5.206	93.409	130	228.615
2015	6.684	100.609	130	237.293
2016	16.828	100.609	130	247.437
2017	54.443	100.618	130	285.061
2018	123.699	100.656	130	354.355

The accumulated installed capacity of renewable energy power generation facility in Taoyuan City per year(unit: MW)

In order to promote smart energy, a pioneering agribusiness smart grid was constructed at Taoyuan Agriculture Expo, which included a number of wind and solar power generation facilities are located, which were capable of generating self-sufficient electricity



via the energy storage system.

6.3.2 Taoyuan's strength in Smart Energy

Renewable Energy Development Act regulates that the big energy user shall install renewable energy power generation and storage facilities with certain installed capacity or purchase a certain amount of electricity generated from renewable energy and a certificate. There are 32 industrial zones in Taoyuan City, the roof type solar photovoltaic and the development of energy storage facility will become the main renewable energy policy. In addition, Taoyuan City have provided subsidies from 2015 to 2018.

6.3.3 The potential areas in which Taoyuan and Thailand can cooperate in Smart Energy

Taoyuan Agriculture Expo as well as the exhibition of Energy Taiwan will be a good area to visit. 2019 Energy Taiwan exhibits PV, wind energy, HFC, smart storage and green finance & insurance pavilion, besides, national and subnational government also displays the outcome of energy policy and technology.

6.4 Smart Buildings

6.4.1 The implementation of Smart Buildings in Taoyuan City

- The Department of Urban Development of Taoyuan City Government is establishing a platform, Building Information Modeling (BIM), integrating all kinds of the license database for application in designing and administrative review.
- “Citizen Card Integration Application” is one of the 10 major themes of Taoyuan Smart City Application. Hence, the Department of Urban Development of Taoyuan City Government promotes citizen cards to the community access control system by subsidizing the communities in Taoyuan city. And in newly-built collective house cases, we adopt the MIFARE card identification system for access

control also. It can serve as a community door, the use of elevators, lanes and mailboxes. Providing an upgraded and smarter function for the Citizen Card, it had also been well used as renting bicycles, discounts on exhibition halls, transportation discounts for silver and mentally handicapped persons, and paying fees. Achieved what so-called "multi-card in one, one-card of multi-purpose".

6.4.2 Taoyuan City's Strength in Smart Buildings

- The Ministry of the Interior had revised the "Intelligent Green Building Promotion Plan" on November 5, 2013. This plan stipulates that a "Green Building Label" should be obtained for a newly-built public building which total construction cost reached NT\$ 50 million. And those have reached NT\$ 200 million should apply for another "Intelligent Building Label".
- In order to promote the intelligent green buildings, Taoyuan City Government had announced the "Autonomous Regulation of Low-carbon Green City Development in Taoyuan City" on July 1, 2016. The Regulation requires that designating the buildings in a specific area to obtain the "Intelligent Building Label" is a must. At present, public buildings are used as demonstrations for implementing smart buildings.
- The number of "Candidate of Intelligent Building Certificate" and "Intelligent Building Label" in Taoyuan City has reached 16 pieces per year averagely, and there are 19 pieces in 2019.

6.4.3 The potential areas in which Taoyuan City and Thailand can cooperate in smart buildings: On this subject, Taoyuan City Government will share case studies of public smart buildings for references.

6.5 Smart Healthcare

6.5.1 Taoyuan's current situation in Smart Healthcare

Through the smart medical service platform (Long distance,

Rehabilitation car and Medical small butler combined with multiple services) and combined with smart detection equipment (wearable device or bracelet) to improve medical care and long-term care quality.

- The smart medical service platform (Long distance, Rehabilitation car and Medical small butler combined with multiple services): Completed remote health care facility equipment in 54 community care centers (including 13 district Public Health Centers) and interfaced with the medical butler system, providing blood pressure measurement service to facilitate the public's accessibility and convenience when citizens are in the contract medical institution in the city, the doctor will take the initiative to check the blood pressure measurement results to provide reference for the doctor's treatment and medication.
- Smart detection device (wearable device or bracelet): The city cooperates with the research institutes to conduct atrial fibrillation measurement through the research and development of ECG bracelet during the integrated screening of the health clinics, and is measured by the case manager at the base of the 7 contract medical clinics to make the people who detect abnormalities get timely medical attention, and identify potential cases early to reduce the chance of a stroke.

6.5.2 Taoyuan's strength in Smart Healthcare

This city is the gateway to Taiwan with Taoyuan International Airport; in recent years, it has developed into Taoyuan Aviation City with production, living and added value; with the opening of the Airport MRT line, it has a very good sightseeing advantage great for promoting tourism and medical treatment and social demographic structure changes of Taiwan. Nearly 15% of the elderly population is part of a high-age society and smart medical care needs are most needed. This creates a good opportunity for developing smart healthcare.

6.5.3 The potential areas in which Taoyuan and Thailand can cooperate in Smart Healthcare

The City signed a letter of intent for cooperation in a medical education park with Tsing Hua University and Chiao Tung University in April 2018; in the future, Tsing Hua University "Education research and development and Medical Park" is expected to be built in the Aviation City Project Area to provide acute and serious medical services, participate in public health activities and handle international medical care. Chiao Tung plans to set up an "Education research and development and Medical Park" in the Qingpu area to combine innovation, creativity and entrepreneurial energy of the Qingpu District, to develop smart technology, smart biomedical and smart management. At the same time, it handles an international medical hospital with teaching and research functions to improve medical resources in surrounding areas, which is good for the development of Taoyuan International Medical Features in the future.

6.6 Smart Education

6.6.1 Taoyuan's current situation of Smart Education

Taoyuan City won the "World Annual Intelligent Community" Ultimate Award by ICF (Intelligent Community Forum) for the first time this year. In the theme of "Infinite Learning", we have shown greater possibilities of achieving teaching and learning outcomes by using new digital technology. We have been continuing to establish smart classrooms in recent years. So far, 3000 smart classrooms have been built. We hope to have more than 5000 smart classrooms next year to achieve the goal of popularizing smart education. In addition, teachers of Taoyuan have been promoting the teaching and application of the smart classroom system with great enthusiasm and efficiency, and are continuing to develop and innovate. Our teams ranked the top in the cross-strait smart classroom competitions the past three consecutive years.

6.6.2 Taoyuan's strength of Smart Education

The incorporation of digital reading, interactive technology, and computational thinking in the smart classroom allows students to develop English fluency naturally and confidently via real-life contexts. The implementation of timely feedback system on remedial instruction and application of tablets in cooperative learning and brainstorming reinforce students' engagement, maximizing the often-neglected preview, diagnosis, and remedy, while reflecting how education unlocks endless possibilities. The first smart classroom in Da You Junior High School was installed in 2018. Since then, the amount has been expanded and reached 50 this year. For the past two years, students have shown significant growth in the results of the Comprehensive Assessment Program for Junior High School Students. Students who received "A" scores in the five subject tests increased significantly. Meanwhile, the proportion of students achieved "Excellent" level is higher than the national average while the proportion of students in "Improvement needed" level is much lower than the national average.

6.6.3 The potential areas in which Taoyuan and Thailand can cooperate in Smart Education

Our teachers' experiment and practice innovative teaching methods using cutting-edge learning software, interactive response systems, tablets, AR/VR devices, and educational apps. Teachers are encouraged to facilitate learning and to boost basic competence in learners by integrating digital tools, the Internet and physical resources.

6.7 Smart Manufacturing

6.7.1 Taoyuan's current situation in Smart Manufacturing

Autonomous driving is a booming trend. Taoyuan connects software industry in Taipei and IC hardware design in HsinChu to promote smart driving industry in Taiwan. Hutoushan innovation Hub includes connected and smart driving center and also IoT security center. It provides a full-functioning

environment for automated vehicles related industry cooperation and development here. Taoyuan owns the most automotive electronics, automated vehicle, automotive power manufacturers. Taiwan is the key connecting hub and center of East Asia. We will continue to be innovative and be creative in Smart Manufacturing.

6.7.2 Taoyuan's strength in Smart Manufacturing

There are 32 industrial zones have been established in Taoyuan. Taoyuan's annual industrial output is NT\$2.6 trillion. Taoyuan's industrial development began from low-cost manufacturing and OEM in the early days, with a strong focus on electronics, machine tools and textile manufacturing. After automotive and ICT industries become the main drivers of growth, logistics, electric vehicles and cloud computing industries now play increasingly important roles.

The potential areas in which Taoyuan and Thailand can cooperate in Smart Manufacturing: Our Hutoushan innovation Hub includes connected and smart driving center and also IoT security center. We provide match-making, between Taoyuan's manufacture needs and Information providers skills. The startups from Thailand are welcome to visit our Hub.

7. Tainan City

7.1 Smart Healthcare

7.1.1 Tainan's current situation of Smart Healthcare

The National Development Council said that due to the continued low fertility rate and the extension of the average life expectancy of the people, it is estimated that the ratio of elderly people over 65 years in Taiwan had reached 14.36% by 2018. Officially entering the internationally known "old age society". In 2026, Taiwan will enter a "super-aging society," with an elderly population of 20.63%. According to the 2013 National Health Interview Survey, 86.3% of the elderly are consciously or diagnosed at least 1

or more chronic diseases, 68.6% had at least 2 chronic diseases, and 47.3% had at least 3 chronic diseases. Female elders have a higher rate of chronic illness than males. According to the 2013 Survey on the Condition of the Elderly by the Department of Health and Welfare, 81.1% of people aged 65 or above are concerned by chronic diseases. The main chronic diseases were hypertension, osteoporosis, diabetes, and heart disease. In addition, among the six municipalities directly under the central government in Taiwan, the prevalence of hypertension in Tainan City is higher than the others. We need to reduce the hypertension to improve elders' health. Based on our studies, the challenge of reducing hypertension are "low awareness", "no continuous healthcare" and "poor patient compliance". The Smart Health Community Project had been launched in 2017 in response to the prevention and treatment of hypertension. In this project, widely deployed "Smart Health Stations" in community to improve hypertension prevention awareness is major effort. The vision is to use technology to connect medical services and to assist community care follow-up. This project also integrate hospital community health promotion activities to assist in hypertension case monitoring and treatment. Until now, service covered 37 districts of Tainan City with 300 stations and 35,000+ members. In addition to, this project linking doctor's office to make blood pressure more meaningful. Now we cooperated with 11 hospitals and 65 clinics as members' healthcare to provide the continuous healthcare. In 2019, project team leverage Big-data technology then find out 400+ hypertension high risk cases. Those cases had been tracked by Health Bureau. The Smart Health Community Project help Tainan winning the ICF Top 7 in 2018.

7.1.2 Taiwan's strength of Smart Healthcare: As we all know,

Taiwan is good at information technology. The Smart Health Community Project using cloud, IoT and big data technology to achieve the goal.

7.1.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Healthcare: Smart hospital: such as patient monitor, smart bedside card, smart whiteboard and etc. Smart IoT health devices: connected blood pressure meter, connected blood glucose meter or community blood pressure station and etc.

7.2 Smart Education

7.2.1 Tainan's current situation of Smart Education

Tainan City is developing smart city education, aiming at improving the campus smart learning environment, promoting digital equal opportunities and cultivating new digital workforces in the future. In the end, we will reach the vision of cultivating the digital citizens and helping people implement information technology for lifelong learning. There are three aspects: promoting the construction of digital education classroom, innovative digital learning and development of digital education in rural areas.

- Construction of digital classrooms: The wireless network environment of primary and secondary schools has reached the goal of 100% coverage and network bandwidth, and combined with the government network to provide people with a ubiquitous digital learning environment in the campus wi-fi environment. The resources of industries, governments, universities and research institutes have been integrated to build the City's Hahay teaching cloud platform, cloud and intelligent digital resources, and big data analysis technologies have been used to optimize platform services and provide digital school adaptability services.
- Innovative digital learning: In order to foster next-generation digital technology talents with international

competitiveness, the City has actively promoted a new mode of action learning on campus and has assisted more than one-quarter of the City's primary and secondary schools in the development of digital learning and school-based curriculum development through the use of mobile vehicles and networks to expand the diversified and life-based learning for the students. The city government combines production and education to promote STEM self-education, develop students' application skills of emerging technology, such as holding "Fablearn Taiwan Self-Education Annual Conference". The city government promotes the courses of artificial intelligence robots in cooperation with the City's Maker Center of Southern Taiwan Science Park Bureau. The city government also from a strategic alliance with National Kaohsiung Normal University's Self-education Base to help nearly 30% of the city's teacher training in primary and secondary schools.

- Development of digital education in rural areas: In order to reduce digital gaps and promote fair digital opportunities, the City has set up "Digital Opportunity Centers (DOC)" in rural areas to use school venues to provide digital learning for local citizens to meet their needs of digital use, and further to apply the digital tools in life, such as aerial cameras to record local beautiful scenery and cultural preservation, distance medical care, and to set up a webpage to sell agricultural produce. A total of 107 courses and activities are provided to promote equal opportunities for digital applications by 18 organizations including other units and bureaus, nearby colleges and universities or non-governmental organizations. In order to strengthen the education environment in rural areas and improve the human resources needed, we guided rural schools in remote areas of the City in 2017 to innovate in digital learning in rural areas and promote equal learning opportunities for the

urban and rural areas. We have been collaborating with Qualcomm Inc., Far EasTone Telecom, Industrial Technology Research Institute and ASUS for 2 consecutive years since 2016 on the “Wireless Care – Cloud Learning Tour Program” to provide fund for the science and technology equipment of 23 rural schools to achieve aim of the construction of a 4G smart city through innovative 4G mobile AP and outdoor teaching platform innovative learning.

7.2.2 Tainan’s strength of Smart Education

According to the Global Networked Readiness Index, Taiwan’s global ranking of 18 in 2016 shows that Taiwan has advantages in digital environmental infrastructure and the popularization of the Internet (World Economic Forum, 2016). On promoting smart city education, recently, Tainan City has gradually completed the development of a forward-looking information technology learning environment cooperated with cloud digital construction, and promoted the Hahay teaching cloud and action learning innovative teaching mode, from which it can be observed that in the field of wisdom education, Tainan City has advanced from the phase of “Basic Classroom Software and Hardware Environment” and “the Integration of Digital Teaching Materials and Learning Resources,” to the phase of “Developing Innovative Teaching Mode.”

7.2.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Education

According to Thailand Ministry of Education's policy on smart city and smart education promotion, it can be known that the current promotion of Thai wisdom education is similar to " the Basic Classroom Software and Hardware Environment" and " the Integration of Digital Teaching Materials and Learning Resources " in Tainan City. For example, the Ministry of Education of Thailand

commissioned Chulalongkorn University to develop educational software and integrate related software and hardware. In the field of learning, the Ministry of Education of Thailand is also concerned with improving students' foreign language ability. Currently, the Ministry of Education of Thailand has cooperated with the British Council and Chulalongkorn University to develop a smart software for assessing students' oral English pronunciation and writing skills, and to develop a game-based English learning app as a tool for integrating into the curriculum (Varissara, 2018) to comprehensively improve the English ability and competitiveness of Thai students. If we want to communicate with Thailand on smart education and even need follow-up cooperation, we both may first review "the Basic Classroom Software and Hardware Environment", "the Integration of Digital Teaching Materials and Learning Resources ", and how we've implemented "Science and Technology Improving Language Learning" in the learning field. In the long-term phase, we can assist Thailand to set up seed schools and teams of teachers through our experience of developing innovative teaching mode. By doing this, we expect to achieve the vision of mutual benefit and prosperity between Thailand and Tainan. The implementation of "science and technology promotion language learning" in the learning field. As the basis of communication. In the long-term phase, we can assist our country in setting up a seed school and a team of teachers to transfer the city's R&D experience in order to achieve the vision of mutual benefit and mutual prosperity.

7.3 Smart Transportation

7.3.1 Tainan's current situation of Smart Transportation: 2019 Smart City Innovative Application Award, FIABCI-Taiwan Real Estate Excellence Awards, 2017 & 2019, ICF Top 7 Intelligent Communities of 2018, Global Cities Registry for

ISO 37120, 2017, Gold Awards, 2015.

7.3.2 Tainan's strength of Smart Transportation

- Major problems in transportation: Rising traffic congestion during rush hours and festivals, Difficult to widen roads in downtown, Low coverage and use of public transport, especially the transportation needs in rural area, Lack of parking lots in downtown.
- Mindsets of solving the problems in Tainan: For traffic jam: to monitor and manage the traffic in real time; For public transport: to explore alternatives to current system and build new type of service (for example: MRT); For parking issue: to create more parking space for car drivers. To improve parking turnover rate and reduce the enforcement costs; For last mile: to spread the public, shared bike service.
- Achievements and strength in smart transportation in Tainan: 4G Smart Bus(4G WiFi hotspots, Bus dynamic information service, Tainan City Bus APP); Taxi Bus(Demand responsive transport system, Shared taxi as bus); Smart public bike sharing service(Gravity sensor and GPS: To monitor current status and location of all bicycles by GPS, and the gravity sensor can warn the service center when bicycle is dumping); APP(To locate bicycle station, membership registration, calculate the exercise index (calories) when riding T-bike by GPS and connect to the following LBS); LBS(LBS will show the promotion or discount information of shop near the users' location, attract users to shop by smart T-Bike LBS and APP); Intersection warning system(For riders' safety, we set a vehicle sensor at the signal of intersection, and set a warning light on handlebar of bicycle); Real-time traffic monitoring & controlling(Dynamic message sign, AI Traffic camera, Incident monitoring, Traffic signal monitoring and control, Active traffic management); Smart parking system(Automatic detection, recognition &

calculation-introducing Intelligent Parking Manage System into off-road parking lots, Multiple cashless payment and App linked to show parking information-Tainan smart park App, Increasing parking management efficiency-Smart Roadside Parking Meter System BOT Project); Smart cloud platform(Big data analysis, Decision making support, Prediction)

7.3.3 The potential areas in which Tainan and Thailand can cooperate in Smart Transportation

- ICT(Information and Communication Technology)and ITS (Intelligent Transportation System): The traffic type and problem are similar between Thailand and Taiwan. Taiwan is a mature and leading country in ICT. This supports and speeds up the development of Intelligent Transport System in Tainan. The experience of solving traffic issues and the capability of ICT applied in ITS could be shared with Thailand.
- Smart public bike sharing service: Smart T-bike in Tainan is the only and first smart public bicycle system in Taiwan, and we also hope that the experiences and technology of smart public bicycle system can be promoted as international issues. Providing a smart, convenient and safety public bicycle system to citizen and tourists.
- Real-time bus arrival information system: Tainan City's real-time bus arrival information system was built in 2004, the system's user interface and functions are reviewed and improved continuously with public demand and suggestions. Also, fully developed the technology and the number of users is growing by more than before. It is recommended that the experience of the Tainan city's real-time bus arrival information system to Thailand for promotion of technical communication.
- Smart parking meters: Smart city and IOT concepts are used to create the whole new and first smart roadside parking

meter system in the world. The meters automatically recorded the start and end times of parking in the database so there is no need for manual parking billing and payment. In addition, people can pay the parking fee by electronic tickets at the roadside payment kiosk.

7.4 Smart Energy

7.4.1 Tainan's current situation of Smart Energy

Awarded low-carbon norm city in 2011 Tainan City has initiated energy transformation schemes through management of supply and demand side of energy, and energy market policies. These schemes lead to 5 main targets, including elevating the consumption of renewable energy, building smart electrical grids, escalating resilience, and shaping regional diverse energy supply market. Tainan City strives to increase the proportion green energy supply. Solar City Project plays a vital role in encouraging solar photovoltaic (PV) installation by demonstrating on public buildings, promoting actively, mandating implementation, and et cetera. So far, the amount of installed solar PV capacity has reached 1051MW, which is able to power 13.5MWh, including 5 roof type and 5 ground type solar PV projects. This outstanding performance was awarded the APEC Energy Smart Communities Initiative Best Practices Award in 2017. And, we target to install 2GW solar PV capacity in 2022.



7.4.2 Tainan's strength of Smart Energy: Our innovative strategies have achieved 9 leading positions:

- We drafted the regulation of public buildings installing solar photovoltaic management. This regulation mandates public buildings to rent out their roofs or open spaces to the system operators. Public buildings owners are able to receive the

rent, which Tainan City requires public buildings owners can invest 100% of their rental revenue in education promotion, energy efficiency and carbon reduction advocating, and other public restorations.

- Setting Tainan Solar City Information Website: This website provides citizens up to date news and friendly information service of Tainan Solar City Project, and it was the first focal website set by local government in 2011.
- Tainan City has collaborated with banks to establish an exclusive financing scheme: Due to the fact that it is expensive to install solar photovoltaics, and in order to acquire the financing citizens need to pass through the credit evaluation and on site investigation. So, it is a great achievement to be able to establish an exclusive financing scheme.
- Budgeting the subsidies, and offer incentives reward: We have budgeted the subsidies around NT\$ 30-50 million and drafted sub-sidy program, and we hope that will bring more citizens who would like to participate in this project for installing solar photovoltaics through small amount subsidy per case.
- We are the first city which acquires the certified business of solar photovoltaic commissioned by Ministry of Economic Affairs. For the sake of convenience toward citizens we leap at the chance to take the certified business of solar photovoltaics from Bureau of Energy, Minis-try of Economic Affairs. The cases we have certified range from 30kW to 500kW. As for the types we issued include roof type and ground type.
- Tainan City Self-Government Ordinance for a Low-Carbon City was legislated, which is a leading policy in Taiwan in 2012. According to the 23rd regulation, we have announced 647consumers, whose electricity contracted capacity are more than 800kW since 2012. This regulation restricts these

consumers to adopt at least 10% of renewable energy given that large energy users consume great proportion of electricity and account for most of GHG emissions.

- The first city who deregulated the legal buildings with illegal roofs install solar photovoltaics conditionally. We publish the information and counseling methods about transforming and reinforcing the illegal roofs, and establish a focal service point for people so as to enhance their willing to install solar photovoltaics.
- Tainan City has finished the procedure to select regional system operators in 2018 as the leading norm in Taiwan. Upon these cases, city government creates a match-making platform aggregating the selected solar panel system operators and citizens, the roof owners, to accelerate the installing procedure. Neither government direct subsidy nor citizens investment is required, the selected system operators by open bidding are responsible for the installation, operation and maintenance of the whole solar PV generators for a contracted power purchase agreement of 20 years. The major profit of this operation goes mainly to the system operators, and then the roof owners claiming minimum 10% of the profit. We will continue to select the other regions' system operators in 2019.
- The first green energy independence practical site in Taiwan: In order to coordinate with central government's policy a public-private partnership Smart Green Energy Science City Program in Shalun, Tainan, Taiwan, was proposed to attract private sectors to invest in public infra-structures in 2018. Four vital pillars, solar PV power plants, smart grids, energy storage systems, and an energy manage center compose this smart city, which integrate renewable energy supply, energy saving, and Internet of Things (IoT) technology to coordinate the whole energy distribution systems of the smart city in Shalun, Tainan.

7.4.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Energy

Green technology industrial is one of ‘5 plus 2’ innovation industrials policy, Tainan was selected to build the Shalun Smart Green Energy Science City and be invested in approximate \$NT 56 billion. Co-research center, demonstration sites, and Academia Sinica Southern area are the core area of Shalun City as the base of developing green energy technology, and it will integrate academic institutes, legal person, public enterprises, and private enterprises to contribute to the green energy technology in creating energy, energy efficiency, energy storage, and system integration fields. In order to achieve the goal of increasing the demand to bring the ability of innovation and thus the innovation ability driving the development of industrials, we expect this Smart Green Energy Science City will create \$NT 17 billion value, increase the employment, around 8,250 persons. Overall, the first term of construction is nearly completed. And the second term of the construction relevant works of this city are expected to finish by 2022 followed by the third term starting in 2023. Tainan Solar City Project received the APEC Energy Smart Communities Initiative Best Practices Award in 2017, which was the 1st receiver of Taiwan local government. After amending the Electricity Act, renewable energy generators are able to wheel power or supply power to customers directly. Google announced to purchase the renewable energy in Tainan City, Taiwan, which is the first case in Asia, Google will buy 10 MWh electricity in the near future in order to power the Google data center found in Taiwan. As result, it is able to fulfill to consume 100% green energy without carbon emission. We hope the collaboration can continue for so long, and also anticipate other businesses to join in this market to boost this green economical effect together in Tainan City.

7.5 Smart Manufacturing

7.5.1 Tainan's current situation of Smart Manufacturing

- Tainan gained the accolade of being named by the ICF as one of the Top7 Intelligent Communities of 2018. Under the banner of “utilizing technology to transform an ancient city”, Tainan has been focusing on technologized development in six major spheres: a smart city operations management center, water conservancy & disaster prevention, smart transportation, mobile learning, healthy communities & tourism, and manifesting Tainan's smart city development potential.
- Tainan's manufacturing industry is a stronghold of southern Taiwan's manufacturing sector. Tainan has almost 10,000 factories, which account for 12.72% of Taiwan's total factories, and has initiated the Southern Taiwan Auto/Motorcycle Parts R&D Strategic Alliance and the Taiwan Precision Machinery and Mold Tool Strategic Alliance. Also, for 35 years in a row, it has held southern Taiwan's biggest automated machinery exhibition, the Tainan Automation Machinery and Intelligent Manufacturing Industry Show. In 2019, it featured 240 manufacturers with 902 booths displaying a large number of the latest metal processing machines from home and abroad.

7.5.2 Tainan's strength of Smart Manufacturing

- The Southern Taiwan Science Park with TSMC as an occupant, and the Shalun Smart Green Energy Science City established with public-private investment of NT\$56 billion, shine as twin engines of Tainan's economic development. Complemented by an abundance of talent resources, they will form a complete and solid regional economic corridor of industry-government-academia collaboration.
- Tainan City Government has gone to all lengths to deliver policy support and subsidies for manufacturing industry development. For instance, every year it carries out the

Tainan Local Industry Innovation R&D Promotion Plan (a local SBIR program), encouraging enterprises to conduct innovation research, and reducing SMEs' R&D risk, in six main areas ranging from green energy technology to metals and machinery. It also assists technical matchmaking through alliances and the energetic input of the Tainan SME Service Team. And every year it carries out the Tainan Global Trade Cooperation and Expansion Program, assisting exhibition participating enterprises to co-market their products and to maximize the synergies of industrial clusters.

7.5.3 The potential areas in which Tainan and Thailand can cooperate in Smart Manufacturing: The aim of Shalun Smart Green Energy Science City's development is to build a smart eco-city, which coincides with the concept of Thailand's announced intention to develop 100 smart cities. In the future, we can connect with Thailand in the direction of smart city development and cooperation.

7.6 Smart Building

7.6.1 Tainan's current situation of Smart Building

In order to adapt to the new lifestyle, buildings have made our life more convenient, safe, healthy and comfortable with the continuously evolving technology and products. Smart buildings have been developed in Taiwan for quite some time. Since 2003, the Architecture and Building Research Institute, Ministry of The Interior has started to promote the Intelligent Building Evaluation Manual . In 2016, the classification system was established after continuous revision.

7.6.2 Tainan's strength of Smart Building

The advantage of Taiwan lies in the central government's emphasis on smart buildings. In terms of public buildings with a construction cost of more than NTD 200 million, the design of smart buildings and application for intelligent

building label review are required. According to the official website of the Green Building of the Architecture and Building Research Institute, Ministry of The Interior, certifications are applied for 449 smart buildings in the country, of which 30 are Tainan City.

7.6.3 The potential areas in which Tainan and Thailand can cooperate in Smart Building

The P5 office building of the 14th TSMC plant in the Southern Science and Technology Park in Tainan City won the first Excellent Intelligent Building Award in 2018. It is one of the six award-winning buildings. It shows that Tainan has developed to a

smart city in certain extent. Second, Shalun Smart Green Energy Science City (located in the surrounding area of Tainan HSR station) which was developed by the government aims



to develop a smart eco-city. In addition to the consideration of intelligence and integration of the symbiosis concept of nature, the living system of the community was constructed with the value of human orientation. The park is committed to facilitating industrial chains such as solar power, wind power, self-driving cars and other green energy research centers, green energy demonstration areas, smart ecological communities, low-carbon transportation systems, smart 5G street lighting systems, automatic control, and ecological waterways. Combining the core concepts of smart building and green building development, it is believed that it is what Thai people who believe in harmony and nature needed.

7.7 Smart Government

- 7.7.1 Tainan’s current situation of Smart Government: Tainan City, an ancient city with historical and cultural resources, faced several challenges during our urban development processes. To solve current difficulties and promote urban sustainable development, Tainan City Government has applied intelligent technology and undertaken Smart City Plan from 2011, transforming an ancient capital into a modern smart city. In collaboration with Industry, Official, University and Institute, Smart City Plan covers a wide range of areas, inclusive of urban governance, disaster prevention, transportation, education, health, tourism, agriculture and green energy, which drives local industry upgrades as well as sustainable development. Tainan City has been recognized as one of the Top 7 intelligent communities of 2018.
- 7.7.2 Tainan’s strength of Smart Government: Tainan City enacts three major methods: Open Data, Open Service and Open Decision, to enhance the service level of quality and efficiency of open data services.
- 7.7.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Government: We could look through areas covered by Tainan Smart City Plan for preliminary discussion then aim at a few potential areas to consider further cooperation.

8. Kaohsiung City

8.1 Smart Traffic

8.1.1 Kaohsiung’s current situation in Smart Traffic

Totally, Transportation Bureau of Kaohsiung City introduce the smart transportation situation in Kaohsiung city as follows: Development of Smart Transportation system mainly includes smart traffic control system, smart parking system, Mobility as a Service (MaaS), and real-time bus arrival information system. In recent years, we also

introduce cellular vehicle probe (CVP) for traffic control, vehicle and road integration system for intersection safety, and autonomous vehicle testing for public transportation. We just won domestic prizes for our 3 systems. The Mass Rapid Transit Bureau of the Kaohsiung City (KMRT) promotes the situation in Smart Traffic, including as follows:

- Provide intelligent traffic management for routine operations. In order to provide people with safer traffic, for the Kaohsiung Light Rail is a public transport construction that shares the right of roads with other of transport, the KMRT Bureau has set up the following intelligent traffic control methods have been completed: At the crossroads signals along the line, implement the priority automatic control system for light rail priority; Ground warning lights are placed at important crossroads to automatically remind pedestrians that the light rail vehicles are about to pass; Set up the smart signals at the crossroads around the routes of the light rails to remind the light rail driver to pay attention to the use of passers-by and have been opened for use.
- Provide new integrated services in multiple payments: In early 2019, the Kaohsiung MRT officially became the first in North Asia, and the third metropolitan transit system using credit card payment in the world, became the first rail transportation system with multiple payments in Taiwan. Moreover, Kaohsiung Light Rail currently accepts e-tickets, and its multi-payment integration service is expected to be launched at the end of the year.
- Provide public Kaohsiung sightseeing guide service: In addition to the opening of the official website of the KMRT Bureau (<http://mtbu.kcg.gov.tw/>) that allows people to browse online at any time, and the Kaohsiung Rapid Transit Corporation provides the Mobile APP, which provides value-added services for Kaohsiung's smart travel and

sightseeing, and has been widely used.

- Provide intelligent robot station service: The Kaohsiung Rapid Transit Corporation built the AI smart station and equipped two intelligent robots to serve. Through the dialogue mode, passengers obtained the multi-service information such as station information, operation information, tourist attractions. The Kaohsiung MRT collects user information through robots, and returns result after big data analysis, providing a new consulting service for MRT passengers. In addition, the Kaohsiung Light Rail platform is open, there are no toll gates at each station, and there are no station personnel. The platform and train compartments are equipped with multi-card readers, and the open-charge ticketing system with honorary fees allows passengers to pass through. The ticket gate can be directly pitted to provide a more open travel environment for light rail passengers.
- Provide open data used for transportation: Provide central government traffic open data applications – the Public Transport Data eXchange (PTX) platform of Ministry of Transportation and Communications(MOTC) (<https://ptx.transportdata.tw/PTX/>); Provide local government traffic open data applications – the Kaohsiung City Government Information Open Platform (<https://data.kcg.gov.tw/>) and the Kaohsiung City Government Data API Platform (<https://api.kcg.gov.tw/>).

8.1.2 Kaohsiung's strength in Smart Traffic

Totally, Transportation Bureau of Kaohsiung City introduce the smart transportation situation in Kaohsiung city as follows: We have obtained several achievements in traffic control integration and public transportation service, and the Kaohsiung MRT has been operating under the red and orange lines. After the construction of the ring light rail and its partial operation, it has created a high-quality mass

transportation environment in the Kaohsiung area. Actually it has realized the development of diversification vehicles and convenient transportation service in Kaohsiung. Further the Kaohsiung Light Rail is the first light rail in Taiwan, and it is also the first system in Asia using Non Visual Catenary (NVC) System. One of the advantages is to leave Kaohsiung's beautiful skyline undisturbed without cable lines. Since its official operation on September 26, 2017, it has provided convenient services to passengers. The number of passengers has gradually increased and has repeated setting a maximum record. The efficiency of Kaohsiung Light Rail services has become a new choice for residents' commuting and passenger sightseeing. It is one of the bright moving landmarks in the Kaohsiung Metropolitan Area.

8.1.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Traffic: Transportation Bureau of Kaohsiung City develop “Smart Travel Service”, “Smart Traffic Management”, and “Smart Traffic Safety”. For “Smart Travel Service”, we kicked off Mobility as a Service(MaaS) Kaohsiung MeNGO project in Dec. 2017. Now, we have 20,000 members. We use big data to analyze travel demand and feedback to MaaS project. For “Smart Traffic Management”, we will strive for “Adaptive Traffic Signal Control”, “Big Data Analysis and Prediction”, “Smart Parking System”, and “AI Image Processing and Data Collection”. For “Smart Traffic Safety”, we will focus on “Large-area Vehicle Blind Spot Warning System”, “Vehicle and Road V2X Intersection Warning System”, and “Technology Enforcement”. And we can exchanges experience and cooperation in above areas. The KMRT Bureau can provide relevant implementation experience, including the construction and operation of MRT and light rail, to facilitate further international exchanges and cooperation with Thailand.

8.2 Smart Government

8.2.1 Kaohsiung's current situation in Smart Government

The Kaohsiung City Government has actively participated in various competitions over the years, which not only increases the visibility of Kaohsiung City, but also is widely recognized, for example:

- Using the information of Open Data and Open API platform, we actively create “Smart Municipal Dashboard” for five major types of municipal information issues, such as safety information, municipal information, people's livelihood information, information services and information monitoring, to assist city government as policy decision-making reference, and providing people with more intuitive wisdom management information. (The Open Data platform won the "Local Government Open Data Gold Award" in 2018.)
- In order to promote the development of AI in Kaohsiung City, the Information Management Center of Kaohsiung City Government conduct the AI development plan with the theme of “Initiatives from Industries, Solutions by Start-Ups, AI Talent Development and Incubation.”, and the AIGO Problem Solving Competition of the Ministry of Economic Affairs was co-operated through in the industry, the demand for AI in the real industry and the local government was sought, and Kaohsiung City was enthusiastically involved in the real industry academic community, and the results is better than expectation.
- The Kaohsiung City Government leads the regional Information Security defense and prevention system in the southern cross-county cities (Pingtung County Government, Taitung County Government and Penghu County Government), and establishes the “Vulnerability Scan Management Platform” (VSMS) for the participating southern counties including 69 agencies and 858

information system hosts conducted vulnerability detection, and established the cross-domain security cooperation model for the first time. In 2019, they were shortlisted for the "Go Smart Awards".

- The Kaohsiung City Government established a smart streetlight demonstration area in the Hama Star area in 2018, and built 49 smart street lights with proactive notification of damage, Wi-Fi, water level detection, air quality monitoring, traffic flow, pedestrian flow and license plate identification. In view of the fact that smart streetlight have power, network and everywhere, it is the best infrastructure for developing smart cities. Therefore, in 2019, we will continue to test more energy-efficient smart streetlight in Zhonghua 5th Road.
- In the 7 indicators of the Wealth Magazine "2019 Smart City Survey", we get leading position in the 4 indicators; "2018 Taiwan Smart City Survey" won the "Leading Group" honor and was voted being satisfactest smart city in governance; and won the third place in the country by "The third session of Smart City Survey by Global Views Monthly Magazine in 2017".
- "Kaohsiung mobile household registration offices and online e-Link system" and "Matching Platform of Immediate Agricultural Manpower" won the Smart City Innovation Application Award.
- "Instant Wireless Transmission 12-Lead ECG" won the 2017 Emergency Medical Association Annual General Award.
- "Love-PASS Cloud Service Platform" won the 2016 Cloud IoT Innovation Award.
- Mobile cadastral map system won the "First Golden Land Measurement Definition Award - Innovation Service Award" by the Cadastral Survey Society in 2015.
- "Kaohsiung City Metropolitan and Remote Area Diverse

Vehicle Action Plan" won the 2019 Award of the innovative application for Smart City.

- In order to provide citizens with a more convenient and intelligent life, we are building a comprehensive infrastructure, integrating information resources across the bureau and providing innovative value-added application services. In addition, we are also actively looking for various public-private partnerships and strengthening the overall information security to provide a safe and comprehensive life for the citizens.

8.2.2 Kaohsiung's strength in Smart Government

In recent years, the Kaohsiung City Government has actively implemented a number of IT projects, including data openness and integration, integration of software and hardware resources, innovative technology development, and cooperation between industry, government and university. It has promoted the opening of government data, industry with AI, and the advantages of communication technology talents and the infrastructure of the smart streetlight demonstration area, It is will help the government move forward to Smart city in the future.

8.2.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Government

Regarding the Kaohsiung City Government's service development achievements in the smart government, we sincerely welcome the Thailand government to visit our government. we are willing to share successful experiences and hopes to seek a cooperation model through mutual visits, expected to establish a closer cooperative relationship.

8.3 Smart Building

8.3.1 Kaohsiung's current situation of Smart Building

Kaohsiung City won 10 awards in the 2013 International Liveable City Competition. For details, please refer to <https://pwb.kcg.gov.tw/Web/BulidHonorDetail.aspx?Cond=>

93692765- 6134-4aea-86a9-bbcadfde3ea4. At present, Kaohsiung city government is also committed to the development of smart cities, including to increase building safety and convenience, energy conservation and green energy (Solar), and of smart transportation and other aspects. All the “Smart” also assisting urban governance through digital information collection.

8.3.2 Kaohsiung’s strength of Smart Building

Taiwan is a well know IT, ICT technology research and development and manufacturing center with abundant talents and resources in the world. It is the most important foundation

for the development of smart cities. The development of smart cities relies on every



smart building and facilities in the city to connect with the smart city network, further expand to life, transportation and other aspects. Since 1992, Taiwan has been committed to the development of building automation technology, and by 2003 officially established the Taiwan Smart Building Evaluation System. In terms of substantive implementation, Taiwan’s government forced all the public buildings have to pass Smart Building Evaluation when the total construction cost over NT\$200 million. In the urban governance, Kaohsiung City Government promoted the unique “KAOHAUSPlan”, making combination between "Green" and "Smart" in Kaohsiung, all the strategies based on Kaohsiung's "Green", and adding "Smart" including building and infrastructure to provide services to the people

and meanwhile lead Kaohsiung to move forward to next city generation.

8.3.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Building

It is very welcome to have an opportunity to discuss further cooperation with Thailand in all the experience and technology exchange. It would be a good start to have a seminar or workshop in the coming year to expand more cooperation aspects.

8.4 Smart Medical

8.4.1 Kaohsiung's current situation of Smart Medical

Kaohsiung city has top medical technology and manufacturing. It has spared no effort in the smart health community recently. In order to assist the application of smart medical devices on clinical promotion, Kaohsiung city set up the "Cloud Smart Health Service Platform". This particular cloud-based health information system comes from AdvMeds company and adapt the O2O(Online to Offline) business model. The program developed integrated health management service and created household/community service model. The model is implemented to 255 clinics and more than 120 communities in Kaohsiung city. This project will be exploring the role of e-Health consumption, patient involvement, and medical communication to look forward on health serveries quality.

8.4.2 Kaohsiung's strength of Smart Medical

Kaohsiung city has advantages to become the best place for developing smart medical city, including high quality medical and health services, top medical technology and biotechnology industry. Additionally, Kaohsiung city can move to build smart medicine systems by applying AI and medical technology innovation.

8.4.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Medical

The “Cloud Smart Health Service Platform” is carry on Health Service Industry Promotion Program, and integrated the medical technologies and device development. It also responded to the world trend as well as demands in Taiwan and expand overseas markets, such as Thailand, Malaysia and Indonesia, to establish an image of an international brand of Taiwan.

8.5 Smart Education

8.5.1 Kaohsiung’s current situation in Smart Education

Kaohsiung City Government Education Bureau introduce the smart education situation in Kaohsiung city as follows: Kaohsiung Municipal Chi Jin Elementary School participated in FIRST World Festival Championship in 2016 and won the Judges’ Award in FIRST LEGO League(FLL), 9 to 16 years old group. To present the FLL theme “TRASH TREK”, students from Chi Jin used plastic cap of PET bottle to decorate the booth and took Taiwanese traditional retro draw game to the competition to make the booth really retrospective. Judges were impressed by the team of Chi Jin since even though the students are not from an English-speaking country, they could still express the concept and intention of design fluently. The team consists of students from Kaohsiung Municipal Kaohsiung Vocational High School of Commerce, Kaohsiung Municipal Kaohsiung Senior High School, Affiliated Senior High School of National Kaohsiung Normal University, Kaohsiung Municipal Fushan Junior High School, St. Dominic Catholic High School, and Kaohsiung Municipal Wun-Fu Junior High School. They participated in FIRST World Festival Championship in 2017 and won the highest accolade of FIRST Tech Challenge(FTC), 13 to 18 years old group, the “Winning Alliance Award Winner.” To challenge students’ robot programing ability, structure design and rotation movement, the goal of the competition was putting

the small ball into the swirl in the corner of the field, or putting a huge ball in the swirl in the middle of the field. This team was the first championship among the Taiwanese representatives and it showed the outstanding achievement of Robot technology education in Kaohsiung. Kaohsiung Lin-Yuan Elementary School participated in FIRST World Festival Championship in 2019 and won the second place of Programming Design Award in FLL, 9 to 16 years old group. To show the theme of FLL, INTO ORBIT, students from



Lin-Yuan used blocks to make Lord Guan, Jade Emperor, and The Village Deity (3 well-known gods in Taoism in Taiwan), combined with Taiwanese folk customs, draw lot

and divination blocks, and made it an experience game. This was the first time for a Taiwanese representative to win the programming prize in the FLL international competition. Open University of Kaohsiung introduce the smart education situation in Kaohsiung city as follows: International Organization of Professional Cultivation and Accreditation (IOPCA) is an international agency issuing professional licenses and accredited by the Taiwan Ministry of Education. In order to keep abreast of international standards, OUK strive to win the agency rights of IOPCCA Greater China Certification courses. Kaohsiung City Government Official Human Development Center introduce the smart education situation in Kaohsiung city as follows:

- Integrating the Largest Digital Centers in the Domestic Public Sector and Using the Resources of the Central

Government E-Learning Platform: Civil Service Development Institute of Kaohsiung City uses the E-Learning Platform of Central Government and set courses of selected competency are established based on the different official ranking. An implementation plan for the promotion of digital learning by the city government has been formulated. Those who complete these courses during their spare time are rewarded and encouraged with 4 hours of vacation.

- International Awards: In 2019 , Civil Service Development Institute of Kaohsiung City participated in The International E-Learning Association (IELA) and Brandon Hall international awards. We won Honorable Mention of E-Learning in IELA and Bronze Medal of Best Results of a Learning Program in Brandon Hall.

8.5.2 Kaohsiung's strength in Smart Education

Kaohsiung City Government Education Bureau introduces the strength as follows: In 2018, Kaohsiung city won the High Distinction Award of national information education achievement of Ministry of Education, and Kaohsiung is also the only city that won the High Distinction Award for six years consecutively in Taiwan. Kaohsiung has excellent performance in the field of information education including four main projects, information security, cloud E-learning, Live co-learning, and programming education. With the cooperation between government, industries, and academia, there are more than 100 schools using tablet computers at the smart curriculums. With the 2019 curriculum guideline of the Ministry of Education, Kaohsiung Education Bureau arranges the implementation plan of program logic education for the 2019 curriculum. Cooperating with Forward-Looking Infrastructure Plan, Kaohsiung Education Bureau builds the digital mobile learning system with the popularization of Wi-Fi on campus to create a

smart-education infrastructure environment. In the future, Kaohsiung Education Bureau will keep creating talents of AI technology by cultivating students' ability of logic operation and literacy of digital education at an early age. Kaohsiung will integrate mobile learning into daily life to create a new concept of Smart AI City. Open University of Kaohsiung introduces the strength as follows: In the 107-1 semester, 2018, OUK established the "Learning Guidance Center" at Thailand - Taiwan Business Association, and carried on asynchronous distance courses to have built a cooperative platform for cultivating talents for Thailand and Taiwan. Kaohsiung City Government Official Human Development Center introduce the strength as follows:

- Civil Service Development Institute of Kaohsiung City integrates policy focuses to develop unique digital courses on City governance and has produced a lot of digital courses on local characteristics.
- By establishing a system for trainee registration , course information and a proprietary digital learning platform, a complete learning process for trainees was established. Comprehensive computerized cumulative data analysis is used to eliminate gaps in functions and targets.

8.5.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Education

Kaohsiung City Government Education Bureau's introduction is as follows: Currently, Kaohsiung City has built 4,000 information technology classrooms with counseling and interactive learning system, and 40 of them will be arranged as SMART CLASSROOMS to provide the functions of self-learning and unlimited time and space teaching, and promote STEM education including the digital innovative curriculum such as Virtual-Reality, Machine Learning, Artificial Intelligence. The live learning system from Kaohsiung, Drlive, narrows the gap of

education between urban and rural areas, and it may create opportunities to connect with Thailand for academic and E-learning teacher training. The exchange of knowledge could be more convenient and the perspective of smart education will be achieved. Open University of Kaohsiung's introduction is as follows: OUK offers Chinese language courses for Thai people to actualize their learning on our E-Learning Platform anytime and anywhere. Kaohsiung City Government Official Human Development Center's introduction is as follows: Civil Service Development Institute of Kaohsiung City can offer digital courses to exchange.

8.6 Smart Manufacturing

8.6.1 Kaohsiung's current situation in Smart Manufacturing

Kaohsiung is a manufacturing hub in Taiwan, and many indicative manufacturing companies are located here. Noted manufacturers have started related investments in smart factories or smart manufacturing, including smart factory building, robotic processing, big data analysis, intelligent process monitoring and management. The investment of leading manufacturers is expected to drive more upstream and downstream players to move towards smarterization, and also help to attract domestic and foreign intelligent related industries, such as software giants, newcomers or startups to Kaohsiung.

8.6.2 Kaohsiung's strength in Smart Manufacturing

In recent years, the Kaohsiung City Government has actively assisted the manufacturing industry to move toward smarterization through various programs, including industrial clusters, value chains, equipment upgrades, innovative R&D, and regional industry cooperation. The Renwu Industrial Park, planned by the Kaohsiung City Government, the Southern Taiwan Science Park, the Qiaotou Science Park, and Luzhu Science Park, Nanzih

Export Processing Zone, Kaoshiung Software Park and KOSMOS Hatch will become the southern technology industry corridor. The Kaohsiung City Government build Kaohsiung a smart manufacturing base from hardware, software and services to assist in the development of related industries.

8.6.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Manufacturing

Taiwan and Thailand are complementary to each other in the global supply chain industry and economic and trade relations have always been close. Warmly Welcome Thailand local industry entrepreneurs come to Taiwan, come to Kaohsiung. Taiwanese manufacturers are one of the global leaders in ICT and IoT technology. Successful establishment of smart factories in Kaohsiung are willing to share their experience. At the same time, we may find the optimal business opportunities and models that works for further cooperation. The two countries can jointly enhance the level of industrial cooperation and establish a closer partnership.

9. Smart Transportation-System Integration Promotion Alliance Project Office

9.1 Smart Transportation System and Application

9.1.1 Taiwan's current situation in Smart Transportation System and Application

System Integration Promotion Alliance (SIPA) Project Office is promoting System Integration (SI) Company to facilitate Taiwanese Expertise to expand their market territories abroad. In terms of Smart Transportation System and Application (STSA), there are several fields related to this topic such as Smart parking, Mass transit control and Smart Traffic Information sharing etc. We will use Smart Parking real cases as examples for explaining STSA. The

first one is X-Parking, they apply “Smart Sensing” and “Indoor Dynamic Positioning and Navigation” technology to integrate their system by using multiple communication technologies. X-Parking had already accomplished 6 car park installation and won the 2016 APICTA AWARD-Communication Application Silver, and 2018 WITSA Outstanding Action Application Award. The other case is one of SIPA’s partner “PaKing” (雲派) devoted to smart parking solution by using a precisely indoor navigating algorithm to develop an efficient parking solution. This year they granted the Best Retail Innovation (Application) Award (Market Potential & Performance) with his oversea partner (1010, HK telecom) to obtain Hong Kong Retail Innovation Award 2019.

- 9.1.2 Taiwan’s strength in Smart Transportation System and Application: Smart transportation technologies have several matured products and well-developed application can apply into smart city. Smart transportation applications are quite widespread in most of cities and rural areas in Taiwan. Taiwan has several unique and exclusive smart transportation solution to compete the world. Due to the increasing demands of smart transportation system and application, there are abundant business opportunities to utilize Taiwanese solution to the world. With the rapid development of mobile communication technology upgrade in recent years, the development of smart transportation systems have also booming. Regardless of the roads, vehicles, mobile devices, or the hardware and software equipment of the traffic management center, they are gradually moving toward the direction of intelligence, making the transportation system operate into a new era.
- 9.1.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Transportation: Smart Transportation System and Application include Smart parking, Mass transit

control and Smart Traffic Information sharing etc. They provide long-term cost-effective solutions using ICT technologies such as IOT, mobile and fixed networks, sensing and data analysis for issues such as traffic congestion, inconvenient parking, traffic safety, mass transit management, etc. In order to achieve the goal of improving the efficiency of mass transit and transportation hardware facilities (including roads and parking spaces), it is the concept of smart transportation applications. For example, traffic dynamic control, route guidance, parking guidance, parking space optimization, vehicle sharing and other solutions.

- Smart parking: through the application of sensing devices, license plate recognition, mobile phones and other devices, provide users with application services such as parking space redirect, parking payment, etc. The problem is to achieve a solution that optimizes the goals of parking space planning and utilization.
- Mass transit control: For mass transit vehicles such as buses, metros, trains, bicycles, etc., use sensing equipment, mobile phones and other equipment to provide public transport time shift schedules, transfer route planning services, or assess the needs of mass transit. The situation is to help adjust the solution of the mass transit operations to achieve the goal of maximizing the efficiency of mass transit operations, and thereby reduce the environmental pollution that may be caused by personal vehicles.
- Smart Traffic Information sharing: Apply sensing or personal handheld devices to judge and analyze real-time traffic demand, and share public information to provide the users to access some general information such as mass transit info, personal vehicles or self-driving vehicles to achieve the utilization of existing traffic vehicles. All these solutions are dedicating to improve, and reduce the flow of

vehicle traffic. There are several tenders for improving parking system in Thailand. Currently, AOT (Airports of Thailand) released a TOR related to smart parking. We (SIPA) are promoting Smart parking SI to participate this tender.

10. Smart Transportation-Institute of Information Industry(iii)

10.1 Smart Transportation

10.1.1 Taiwan's current situation in Smart Transportation: The major business of Institute for Information Industry (III) is focusing on ICT research, development, and digital transformation etc.... Currently, due to the increasing demands of innovative applications of ICT technology application especially Smart Transportation and related solution. One of our institute, Smart System Institute (SSI), devoted to develop smart transportation. This institute created several phenomenal smart transportation solutions. We will introduce two selected cases for example. The first one called CarJ- It is an APP for smart driving and provide real time traffic information for driver and integrated vehicle status service for car owner. This app could assist the driver immediately to fetch useful information and can double check vehicle's condition to reduce accident. The other useful example for smart transportation application is called X-Parking, they utilize indoor positioning and navigation technology to integrate specific map with their system by combining several alternative connection. X-Parking granted 2016 APICTA AWARD-Communication Application Silver, and 2018 WITSA Outstanding Action Application Award.

10.1.2 Taiwan's strength in Smart Transportation

Smart Transportation technology has developed several unique and exceptional solution in Taiwan. Nowadays, due to the technology is towards to matured phase. Taiwan's smart transportation technology could compete the world.

With new development of 5G technology and embedded intelligence AI to system, it will absolutely upgrade the whole services. For the past decades, Taiwan focus on cultivating of smart transportation systems, it is the time to export to abroad for the booming demand.

10.1.3 The potential areas in which Taiwan and Thailand can cooperate in Smart Transportation: Smart Transportation include Smart parking and Smart Traffic Information sharing etc. To transform a city into Smart City, it must include smart factors into the field. Smart transportation could provide long-term cost-effective benefit by using ICT technologies such as IOT, mobile and fixed networks, sensing and data analysis for issues such as traffic congestion, inconvenient parking, traffic safety, mass transit management, etc. Currently, Thailand is building their smart city in recent years, so the Smart Transportation solution could widely apply into major cities in Thailand. We could use Taiwan's smart transportation technology to cooperate with Thailand System Integrated (SI) companies. Then make a JV to compete the transportation related projects that released public.

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